Precalc Warm Up # 3-5

Use the Friday space on your warm up sheet from before the break:

1. What did you do over the very long break?

2. What do you remember about what we were learning before the break?

What were we doing before all this crazy weather???

PC 4.1: Exponential Growth and Decay
PC 4.2: Properties and Graphing Logarithms
PC 4.3: More Log Properties
PC 4.4: Solve Exponential and Log Equations

SL 7.1: Exponent Properties and Equations
SL 7.4: Log and Exponential Review

Today: Remember what we've already learned!

Next Week:

PC 4.5
A little more review
Test PC 4, SL 7
Start Trig.

Plan for a homework quiz,
but not a regular quiz.

Tools

A logarithm is an exponent.

Definition: $y = \log_a x$ iff $x = a^y$

a must be positive and $\neq 1$, and X must be positive

Basic Log Properties:

$\log_a a =$ $\log_a 1 =$ $\log_a a^x =$

$\log_a cd =$

$a^{\log_a x} =$

$\log_a (c/d) =$

$\log_a c^m =$

Solving Logarithmic & Exponential Equations:

Equate bases if possible:

Ex: $2^{x+1} = \frac{1}{32}$

$2^{x+1} = 2^{-5}$

$x+1 = -5$

$x = -6$

Ex: $9^{x+2} = \frac{1}{27}$

$3^{2x+4} = 3^{-3}$

$2x+4 = -3$

$x = -\frac{7}{2}$

When you can't equate the bases, and x is **only** in the exponent, take the log of both sides, and then use log rule #3 and algebra to isolate x.

$2^{x+1} = 15^{2-x}$

$(x+1)\ln 2 = (2-x)\ln 15$

$x\ln 2 + \ln 2 = 2\ln 15 - x\ln 15$

$x\ln 2 + x\ln 15 = 2\ln 15 - \ln 2$

$\frac{x(\ln 2 + \ln 15)}{(\ln 2 + \ln 15)} = \frac{\ln 225 - \ln 2}{(\ln 2 + \ln 15)}$

$x \approx 1.39$

When there are logs on only one side of the equation, simplify as much as possible (condense), then rewrite equation in exponential form:

$$\log_2(x+5) - \log_2(x-2) = 3$$

$$\log_2\left(\frac{x+5}{x-2}\right) = 3$$

$$(x-2)2^3 = \frac{x+5}{x-2} \cdot (x-2)$$

$$8x - 16 = x + 5$$

$$7x = 21$$

$$\boxed{x = 3}$$

If logs are on both sides, simplify both sides (condense), then use logic and algebra to finish the problem.

$$2\ln x + \ln 3 = \ln 5 + 2\ln(x-1)$$

$$\ln x^2 + \ln 3 = \ln 5 + \ln(x-1)^2$$

$$\ln 3x^2 = \ln\left(5(x-1)^2\right)$$

$$3x^2 = 5(x^2 - 2x + 1)$$

$$0 = 2x^2 - 10x + 5$$

$$0 = 2x^2 - 10x + 5$$

$$x = \frac{10 \pm \sqrt{100 - 4(2)(5)}}{2(2)}$$

$$\frac{10 \pm \sqrt{60}}{4} \approx \begin{matrix} 4.44 \\ \cancel{0.564} \end{matrix}$$

Solve. Answer as an improper fraction.

$$\log_2 x - \log_2 (x - 1) = 3 \log_2 4$$

$$\log_2 \frac{x}{x-1} = \log_2 4^3$$

$$x = \frac{64}{63}$$

And don't forget about factoring quadratics !

$$(\log x)^2 + 3\log x - 10 = 0$$

let $y = \log x$

$$y^2 + 3y - 10 = 0$$

$$(y - 2)(y + 5) = 0$$

$$(\log x - 2)(\log x + 5) = 0$$

$\log x - 2 = 0$ $\quad$ $\log x + 5 = 0$

$\log_{10} x = 2$ $\quad$ $\log_{10} x = -5$

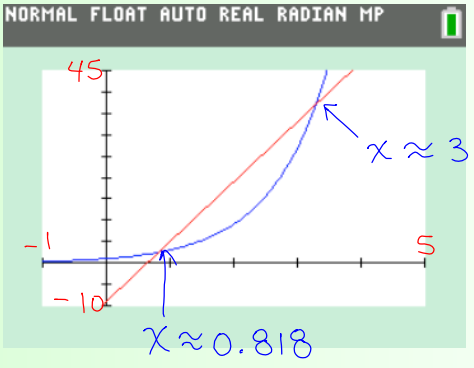
$10^2 = x$ $\quad$ $10^{-5} = x$

$$x = 100, \frac{1}{100000}$$

Finally, when x is in the exponent AND on the main line of the problem, graph it! There is no algebraic way to solve.

$$3^x = 14x - 9$$

window
x-min = -1
x-max = 5
x-scl = 1
y-min = -10
y-max = 45
y-scl = 5



Review from SL 7.1:

Find all solutions:

$$(x^2 + 2x - 7)^{(x+2)} = x^2 + 2x - 7$$

(Any #)^1 = itself

$x + 2 = 1$

$x = -1$

$(1)^{\text{Any \#}} = 1$

$x^2 + 2x - 7 = 1$

$x = -4, 2$

$(-1)^{\text{odd}} = -1$

$x^2 + 2x - 7 = -1$

$x = -1 \pm \sqrt{7}$

check $x + 2$ is odd

$-1 \pm \sqrt{7} + 2$ not odd

Any # > 0

$\bigcirc = \bigcirc$

$x^2 + 2x - 7 = 0$

$x = -1 \pm 2\sqrt{2}$ → only $x = -1 + 2\sqrt{2}$

check $x + 2 > 0$

$-1 \pm 2\sqrt{2} + 2 \stackrel{?}{>} 0$

$1 \pm 2\sqrt{2} \stackrel{?}{>} 0$

Find all solutions: $(x^2 - 10)^{(x+6)} = 1$

$(\text{Any}\# \neq 0)^0 = 1$

$x + 6 = 0$

$x = -6$

check $x^2 - 10 \neq 0$

$36 - 10 \neq 0$ ✓

$1^{\text{Any}\#} = 1$

$x^2 - 10 = 1$

$x^2 = 11$

$x = \pm\sqrt{11}$

$(-1)^{\text{even}} = 1$

$x^2 - 10 = -1$

$x^2 = 9$

$x = \pm 3$

check $x + 6$ even

$\pm 3 + 6$ not even

☹

Simplify

1. $\log_4 2 + \log_4 32$

$\log_4 (2 \cdot 32)$

$\log_4 64$

3

2. $\log 200 - \log 2$

$\log\left(\frac{200}{2}\right)$

$\log_{10} 100$

2

3. Given that $\log_a x = 1.3652$, find

a. $\log_a x^2$

$2(\log_a x)$

$2(1.3652)$

2.7304

b. $\log_a x a^3$

$\log_a x + \log_a a^3$

$1.3652 + 3$

4.3652

Solve. Check for extraneous solutions!

4. $\log_4(x-5) - \log_4 x = 2\log_4 7$

$\log_4\left(\frac{x-5}{x}\right) = \log_4 49$

$\frac{x-5}{x} = 49$

$x \neq -\frac{5}{48}$ extraneous

5. $\log_4(x-5) - \log_4 x = 7$

$\log_4\left(\frac{x-5}{x}\right) = 7$

$4^7 = \frac{x-5}{x}$

$x \neq \frac{-5}{16,383}$ extraneous

HW: Review worksheets

Check answers posted online.
(and make sure HW from Wed before break is complete: p. 228 # 7 LC, 9-16 LC on all)

Monday: Group Event
(Will count as class activity points)
PC: 4.1- 4.4
SL: 7.1